

Impacts of tourism and developmental potential of ecotourism in and around the Changbaishan Biosphere Reserve¹

Wang Xianli (王宪礼)

Institute of Applied Ecology, Chinese Academy of Sciences, Shenyang, 110015, P. R. China

Piao Zhenji (朴正吉)

Administrative Bureau of Changbaishan National Reserve, Antu, 133600, P. R. China

Yeong-Hyeon Hwang, Youn-Jung Cha

Department of Forest Resources, Seoul National University, Republic of Korea

Abstract Ecotourism has been suggested as the alternative for the conflicts between tourism development and nature conservation especially for the protected area, such as biosphere reserve. Based on investigation of tourism resources of The Changbaishan Biosphere Reserve (CBR) and tourism impacts on environment, economy and society, the potential of ecotourism development is analyzed in and around CBR. The results showed that the conditions in the study area are suitable for development of ecotourism, which is an effective approach for sustainable development of CBR.

Key words: Ecotourism, Tourism impact, Biosphere

Introduction

Among many interests related to biosphere reserve, pressures from tourism development might be a major concern because most biosphere reserves have natural, cultural and scenic attractions for tourists. In terms of tourism management, the ecotourism has been suggested as an alternative for the conflicts between tourism development and nature conservation, especially for the protected area such as biosphere reserve. Ecotourism has become popular in recent years around the world, and some scientists have made great efforts in this field^[7, 8, 9].

Changbai Mountain was designated as nature reserve in 1960 and was designated as the first biosphere reserve in China with Wolong Biosphere Reserve and Shennongjia Biosphere Reserve in 1980. In Changbaishan Biosphere Reserve (CBR), critical ecosystems and habitats have been effectively protected, and the fact that there is no people living within the boundary of the reserve has made the management efforts to protect ecosystems and biodiversity much easier. CBR also has been recognized as an important tourism destination. This high demand of tourism implies that among many conflicts in CBR management, the conflict between conservation and tourism development is a very critical issue.

General overview of the CBR

Location

CBR is located in Yanbian Autonomous Prefecture of Korean Nationality, Jilin province, northeast China, and bordered on the east by North Korea. Three counties

(Antu, Fusong, and Changbai) are adjacent to CBR, and the biggest city with airport is Yanji which is about 350 km away from CBR. The total area of CBR is about 200,000 hm².

Landforms

The main landforms of Mt. Changbai can be classified into three types: the volcanic cone, the inclined lava plateau, and lava tableland. The volcanic cone is the part above 1,700 m elevation with the highest peak, Baiyun peak, in Northeast China up to 2,697 m. On the top of the volcanic cone, there is a famous volcanic lake named Sky lake with an elevation of 2,189.1 m for the water surface. The inclined lava plateau is spread around the volcanic cone within the elevation from 1,000 to 1700 m. There are many small scale volcanoes and remnant volcanic hills distributed on the lava plateau surface, and some of the craters formed small volcanic lakes, such as Small Sky Lake, Wangci and Yuanci etc. There is a large area of lava tablelands below the lava plateau region within the elevations from 600 to 1000 m. The tablelands are distributed on the north and west side of the mountain.

Climate

Because of about 2000 m altitude difference from foot to the top of Mt. Changbai, There exist three temperate zones corresponding to the altitude: middle temperate zone, cold temperate zone and mountainous sub-frigid zone. The regional climate can be classified into continental monsoon climate. Precipitation is concentrated in summer from June to August with about 60 percent of total precipitation in a year.

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Biological characteristics

The CBR is a comparatively well-protected primitive forest area in northeastern China. CBR phytogeographically belonged to Manchuria Province, China-Japan District, and plenty of plant species in this area have northern elements. CBR also has a lot of relic, specific precious, rare and endangered species, and is known as one of world's gene banks.

Ecological characteristics

Due to the various geological and geographical histories, CBR has ecologically important characteristics and plays an important role in the field of scientific research. The ecological importance of CBR could be vertical distribution of forest zone, virgin forest, alpine tundra, wetland forest, small volcanic lakes and hot springs.

Importance to local community

The existence of Mt. Changbai is beneficial to local people in many ways. It provides economic opportunities for local people through its natural resources. The outer part of CBR is important timber production base in China and managed by forestry bureau. Mt. Changbai also provides abundant mineral resources such as pumice stone. Mt. Changbai is the origins of Songhua, Tumen, and Yalu rivers. Nowadays several small scale water power stations were constructed and provide considerable quantity of electric power to the vicinity area. Since the natural resources around Mt. Changbai have been utilized by the local people, the conflicts between designation of protected area and consumptive use of the resources might exist.

Conservation and tourism

Tourism demand

CBR has been recognized as an important tourism attraction destination since 1985. It was ratified as the second level open area by the state council in Oct. 1982 and opened to tourists in 1985 by the promulgation of the Ministry of Forestry. By this promulgation, tourism in some nature reserves could be developed under the ratification of the other related authorities for forest management and conservation.

The number of tourists to CBR in 1996 was about 230,000 including about 70,000 foreign tourists which was about 100% increment over 1990. Owing to improvement of the economic and social situation such as the increasing of leisure time and incomes, domestic tourism to CBR is expected to increase. The most interesting characteristics of visitation to CBR could be found in the number of foreign tourists. Among the foreign tourists, Korean is the major foreigners (according to the manager, over 90 % of foreign tourists are Korean)(see Table 1).

Main attractions

In the CBR, many beautiful lakes, valleys and biologically

important places attract the tourists. The most attractive site is Sky lake, a crater lake located on the top of the mountain. There are three access routes to Sky lake, on the north, the west, the south slopes. Among these three routes, northern slope is the main route for tourists since its first opened in 1985. West slope has been opened since 1995, and south slope is not opened to public yet. The main attractions are well developed respectively on the northern slope. The tourism route is about 60 km long, and scenery sites like Sky lake, underground forest, route to Sky lake, Changbai waterfall, small Sky lake, and hot spring were developed and managed for tourism attractions.

Table 1. Number of tourists of 1980–1996

Year	Domestic tourists	Foreign tourists	Total
1980	28936	85	29021
1981	38542	255	38797
1982	29669	108	29777
1983	34880	120	35000
1984	75463	201	75664
1985	86149	476	86625
1986	60907	497	61404
1987	95353	522	95875
1988	101103	636	101739
1989	Not available.	Not available.	Not available.
1990	94857	10596	105453
1991	83698	11734	95432
1992	113472	13426	126898
1993	126914	18759	145673
1994	101263	36672	137935
1995	87286	55817	143103
1996	160000	66580	226580

Seasonal trends

Tourists are concentrated during summer time because of climate situation. From late October to May, the peaks are usually covered by snow, and accessibility is strictly limited. Foreign tourists also tend to concentrate during the summer from June to August.

Tourism management

In terms of administrative structure, the Administrative Bureau of Changbai Mountain National Reserve(CNR) is in charge of tourism management by the Regulations Regarding the Administrations of CNR, Jilin Province. As tourists increasing, a systematic tourism management for tourist program, education facility management, and hospitality management are needed. The Tourism Bureau of CNR was established in 1991 to meet these needs.

In terms of education facilities, the Changbaishan Nature Museum was established in 1985. The permanent poster plates, broadcasting stations, galleries were also established for tourists' better understanding about the conservation of CBR since late 80's.

Tourism impacts

Three aspects of tourism impact have been considered in this paper: environmental, economic, and socio-cultural impacts. In terms of environmental impacts, it is impos-

sible to describe the biological, ecological impacts in detail because environmental impacts of tourism need long term monitoring. Since there is no monitoring system, especially about the impacts of tourism in CBR, more attentions were focused on the possible environmental impacts.

Environmental impacts on natural resources

Garbage pollution

Solid wastes including plastic water bottles, glass bottles, tins, cigarette ends, waste paper, eggshell and rind etc. left by tourists were found in every scenic sites. According to the investigation in 1989 [2], the average solid waste density was 0.31 pieces per square meters in the main scenic sites. Nowadays, the situation is getting better, but it is still a big problem we should confront.

Soil erosion

Soil erosion and accumulation is a kind of natural process that can be intensified by human being's activities. Because of loose structure, the surface materials of Mt. Changbai can be easily eroded. Therefore, the unreasonable activities of human being will aggravate the process of soil erosion and bring out serious ecological consequences.

Soil erosion can be caused by two kinds of activities. One is the opening up new roads and touring routes, and the constructing new tourism facilities. Because of shortage of enough protective measures, soil erosion is serious in some places. Secondly, because the soil erosion is closely related to the damage of vegetation, the tourists' stamping on the vegetation will not only damage the vegetation, bring about the extinction of some species, but also damage the soil structure and cause soil erosion. On the high elevation above 1800 m, soils are barren and infertile, precipitation is rich and wind is strong, so the soil can be eroded easily even by a very light disturbance. The vegetation were badly damaged and soil was exposed in some places on the lakeside of Sky Lake and the tundra zone of the north slope at present. This situation will be aggravated if proper conservative measures are not adopted.

Water contamination

Sources of water contamination mainly include excrement and urine, sewage from restaurants and hot spring bathhouses. Because there are not any facilities for the disposal of rubbish and sewage, the Erdaobaihe river was contaminated. In 1980's, it was difficult to find and bryophyte in water bodies around Sky Lake Waterfall, but it is a common scenery in 1990's.

There are 7 toilets, 31 garbage boxes and 4 hot spring bathhouses distributed along the main touring routes or inside the main scenic sites in the northern slope of Mt. Changbai. Some of these facilities are necessary to the tourism managers and tourists, and some of them are be-

coming a kind of visual pollutants and new pollution sources. For example, toilets and garbage boxes set up on Tianwen Peak and lakeside of Sky Lake have damaged the natural scenarios and polluted the environment around them.

Noise pollution

Noise pollution mainly comes from vehicles and tourists. The vehicles can not only make noise pollution, but also pollute the air with the tail gases. According to research on the content of heavy metals in the trees (Huang Huiyi, 1994), the air pollution is increased in recent years, and has some relationship with the increasing of vehicles entering the Reserve (Table 2). Nowadays, we can hardly find any deer and birds that were often found along the main touring route in the north slope according to our investigation. Noise pollution maybe is one of the reasons, another reason should be the population decreasing of some species.

Table 2. The numbers of vehicles entered the CBR

Year	Bus&Truck	Car&Jeep	Sum
1990	1432	8712	10144
1991	1730	9327	11057
1992	1924	9401	11325
1993	2043	10105	12148
1994	1678	11454	13132
Sum	8807	48999	57806

(Data from Liu Hailiang, 1995)

Tourism impacts on biodiversity

Various environmental impacts described above will change the habitats of species and endanger some of them, such as the endangered *Ophioglossum thermale*, *Phyllitis japonica*, *Boschniakia rossica* etc. Meanwhile, human being's activities can also create new habitats and increase the populations for some other species adapted to human being's living environment.

Economic impacts

Tourism's financial impacts on the CBR management

In order to identify the extent of tourism's financial impacts on CBR management, Annual Financial Reports of Administrative Bureau of CNR from 1990 to 1996 were referred. The management budget of the Bureau from 1990 to 1996 mainly comes from three sources; revenue from tourism, budget from provincial government, and revenue from logging (Table 3). The revenue from tourism and budget from provincial government were considered as stable budget sources for management compared with contribution of each sources to total budget. During 1994 to 1996, the annual revenue from logging was not generated, about 80% of total budget was generated by tourism revenue in each year. In 1996, about 79% was from the tourism revenue which generated in 1995. The relative importance of tourism revenue has been increased since 1994.

Economic impact of tourism on vicinity area of the CBR

For the research purpose 245 domestic tourists and 189 Korean tourists were interviewed in June 1997. In order to estimate tourist's expenditure, 5 expenditure items (cost for food, lodging, souvenir, entertainment, and other costs) were questioned to interviewee. Use fee of the Reserve was calculated based on the records which site the interviewees visited in the Reserve. The geological boundary for estimating economic impacts was Erdao Baihe, the nearest town from main gate of the reserve.

Table 3. The budget of the CNR Administrative Bureau from 1990 to 1997 (Unit : 10,000 Yuan)

Year	Budget				Total
	Revenue from Tourism (%)	Budget from Province (%)	Revenue from Logging (%)	Etc. (%)	
1990	48 (9.1)	-	477 (90.9)	-	525
1991	80.5 (10.3)	77.5 (9.9)	625 (79.8)	-	783
1992	88 (6.0)	97 (6.6)	1284 (87.4)	-	1469
1993	159 (13.4)	118 (10.0)	908 (76.6)	-	1185
1994	289 (54.2)	110 (20.7)	134 (25.1)	-	533
1995	799.5 (86.0)	130 (14.0)	-	-	929.5
1996	923 (78.9)	213 (18.2)	-	34 (2.9)	1170
1997	1000 (79.4)	140 (11.1)	-	120 (9.5)	1260

1) The number in 1997 is estimated number by planning in 1996.

2) Data : Annual Financial Report of CNR Administrative Bureau from 1990 to 1996

Domestic tourist In case of domestic tourists, expenditure was estimated by day-trip and overnight tourists separately for more precise estimation. In order to estimate the number of domestic day-trip tourists in 1996, every person who purchased the entrance ticket was asked about the group size, nationality and itinerary from July 16 to 25, 1996. The ratio calculated by the survey data was used for calculating the number of day-trip tourists and overnight tourists in 1996.

Average CNR use fee for a domestic tourist is 72.8 Yuan (about US\$ 9.00). The expenditure of rest 5 items were divided by the number of accompanied family and averaged. It was estimated that day-trip tourist of CBR spent 218.3 Yuan (US\$ 27.3) per person in and around CBR, and overnight tourist 554.7 Yuan (US\$ 69.3). Average staying period in Erdaobaihe for overnight tourist was 2.6 days.

The ratio of day-trip tourist among the total tourist (41,559) which was obtained from visitor survey at the main gate from July 16 to 25, 1997 was 69%. By this ratio, the estimated number of day-trip tourist in 1996 was 110,400 (69% of 160,000 total domestic tourists).

Estimation of direct economic impact of domestic day-trip tourist and overnight tourist during 1996 was calculated by multiplying the estimated number of day-trip tourists and overnight tourists by the average expenditure of each tourist group. In 1996, domestic tourists who visited the CBR spent about 51.613 million Yuan (about US\$ 6.4 million). Among total expenditure, 47% (24.1million Yuan)

was generated by day-trip tourists and the rest was generated by overnight tourists.

Korean tourist Study on economic impacts by Korean tourists was processed under the assumption that Korean tourists are overnight tourists using package tours. The Korean version of questionnaire was distributed to the Korean tourists who stayed in four Hotels near the main gate of the Changbai Mountain National Reserve and collected when they checked out.

The use fee for each Korean tourist was calculated by the summation of the fee for each sites where individual tourist visited in CBR, and then average use fee was calculated. Calculated average CNR use fee for a Korean tourist is 182 Yuan (about US\$ 23).

In order to estimate average lodging fee and cost for food, eight hotels which were frequently used by Korean tourist were surveyed. Based on the lodging fee of eight hotels, average lodging fee for a Korean tourist was 191 Yuan (about US\$ 24).

The average number of meals was 3 times (lunch and dinner for first day, and breakfast for second day), and the price for meals was fixed at 15 Yuan for breakfast, 25 Yuan for lunch and dinner. So the average cost for meal was calculated into 65 Yuan per person.

Cost for souvenir, entertainment other costs which was surveyed by questionnaire were divided by the number of accompanied family and then calculated the average.

The average expenditure of a Korean tourist in Changbai Mountain National Reserve and Erdaobaihe was calculated into 975.5 Yuan (about US\$ 122). The direct economic impacts of Korean tourists in 1996 could be estimated by multiplication average expenditure of a Korean tourist by the number of Korean tourists. Since it was not possible to get the expenditure data of foreign tourists other than Korean and their number, it was assumed that all foreign tourists were Korean tourists in order to estimate the direct economic impacts by Korean tourists.

The estimated direct economic impacts by Korean tourists were about 64.949 million Yuan (about US\$ 8.1 million). So it was estimated that the total direct economic impacts by both domestic and Korean tourists on vicinity area of CBR in 1996 was US\$ 14.5 million.

Social impacts

Influence on immigration rate

Among many social indices, immigration rate of Erdaobaihe, which has been heavily influenced on by tourism, was compared to that of rest subcounties in Antu County for the purpose of identifying the social impacts of tourism in and around the CBR.

When compared to the immigration rate of five subcounties in Antu County, 3 subcounties showed negative or very low immigration rate (from -31.3 % to 2.2 %), Mingyue subcounty and Erdao subcounty show relative high positive immigration rate, 7.1 % and 13.3 % respec-

tively.

Since tourism is the notable characteristics of Erdao Subcounty, tourism in Erdao could be understood as a valuable factor to increase immigration rate.

Table 4 Comparison of immigration rate of Erdao subcounty with other subcounties in Antu County.

Subcounty	1991	1992	1993	1994	1995
Mingyue	7.07	9.16	36.36	13.50	6.26
Erdao	13.30	39.41	31.32	8.45	8.20
Songjiang	-26.41	-15.79	-31.29	-19.46	-13.36
Liangjiang	2.20	0.00	-3.50	-0.30	-0.60
Shimen	-17.67	-27.39	-20.60	-19.84	-5.81
Wanbao*		-9.30	-35.65	-11.37	-5.64
Liangbing**	-21.18	-18.58			
Antu County	-2.24	2.65	2.95	-0.84	-2.70

* Wanbao was promoted as subcounty in 1992; ** Liangjiang was promoted as subcounty in 1994; - Immigration rate = ((number of people who immigrated - number of people who emigrated) / total population) x 100

Local people's attitude to conservation and tourism

In order to identify the local people's attitude to conservation and tourism, Erdaobaihe was chosen as a case study site and the local people was surveyed during July, 1997.

Distribution of the respondents 187 out of 209 questionnaires in Baihe, 141 out of 165 in Erdao, and 16 in Baohuju were used for the analysis (89.8% male, 10.2% female)

Attitude to the conservation For the question, whether conservation or designation of CBR is beneficial to the government, community, and household, over 90%, over 80%, and over 80% of respondents, respectively, answered yes. Even about the question of residents' right to use natural resources in CBR, over 85% of respondents answered they have willingness to give up the right.

32.6% of respondents (n=344), however, said they used natural resources in CBR illegally within the last 3 years. And the number of people who was prosecuted because of illegal activities in CBR from 1991 to 1996 which could be found in Annual Report of CNR Administrative Bureau reveals that there are still considerable conflicts between natural resource utilization by local people and the conservation of Changbai Mountain National Reserve.

Attitude to the tourism impacts In order to identify the attitude of local people on tourism, items related to economic, social, and environmental impacts were selected from 35 items included in questionnaire.

The economic impact items measure potential job formation, price change, income distribution, and importance as an industry. Over 74% of respondents think that tourism will provide more job, and about 1/2 of residents think that tourism will be a main industry and will play a major economic role. For the income distribution, over 50% of respondents don't have the chances to feel income growth due to tourism, and over 45% think that tourism's economic benefit will be distribute only to the limited groups of residents. Finally, almost half (47%) of respon-

dents said that price has been increased caused by the development of tourism.

The environmental impact items measure impacts on the environment of daily life such as road, noise, recreation opportunity, and impacts on the nature of CBR. In case of infrastructure and services such as road, shopping opportunities, recreation opportunities, public service, many of respondents, 85%, 45%, 60%, 50% respectively, think that tourism contributed to improvement. This indicates that the residents in Erdaobaihe think that tourism contribute a lot in terms of improvement of life quality.

For the environmental impacts of tourism on the natural resources of CBR, about 45% of respondents have expectations that the natural resources of CBR is not going to be destroyed by tourism. At the same time, residents (over 60%) foresee that tourism will provide incentives for restoration of natural resources in CBR.

The social impact items monitor tourism's impact on crime rate, standard of living, culture, resentment. Over 50% of respondents think tourism is not relevant to crime rate. Four out of ten (38%) respondents think that their living standard was improved by tourism, and about 60% of respondents think that meeting tourists will be a valuable experience. About 40% of respondents think their culture will be changed by tourism, and resentment of local resident by high spending of tourists will influence their way of life. Three out of 10 respondents think that the local residents who live in a tourism destination will suffer because of tourism.

About the overall impacts of tourism, six out of ten respondents (64%) have positive attitude. And only 6% of respondents said the cost generated by tourism will be more than its benefit. It was identified that although local people considered the negative social and cultural impacts, they put more weights to positive economic impacts and improvement of daily life.

Other managerial implications

Attitude to tourism development Over 75% of respondents think that tourism in and around CBR should be encouraged. This means that the attitude of local people around CBR to tourism is still favorable.

Educational experience About the question of whether tourist had the guide or interpretation experiences or not, 93% of Korean respondents (n=187) said that they had experience of interpretation about the nature of CBR, and 68.3% of Chinese respondents (n=243) said that they had interpretation experience. Compared to Chinese tourist, Korean tourist has more experience of interpretation, and almost every Korean tourist who experienced interpretation service said that it was by tour guide.

Evaluation on the management of the CBR In contrast to over 45% of domestic tourists who satisfied with the state of management in CBR, 25% of Korean tourists think that the CBR is managed well. Over 30% of Korean tourists have negative attitude to management of

CBR, and in case of domestic tourists, 14% of them think the management is not good.

Developmental potential of ecotourism in CBR

Scientific value for development of tourism resources

Tourists to CBR can enjoy landscapes of thousand kilometers in 60 km because of the vertical distribution of vegetation, and experience various climates from temperate to rigid zone.

The virgin forest can provide the resort for tourists to come back to nature, and help people to understand the earth and the nature.

There are many special animals and plants in and around CBR that can be designated as the scenery targets except for their scientific value, such as *Ophioglossum thermale*, *Phyllitis japonica*, *Boschniakia rossica*, etc.. To understand the origins and the present situations of these species is also an important aspect of ecotourism.

There are many scenery sites left to be exploited in and around CBR, such as Wangci, Tizihe, Jinjiang Valley and High Mountain Pasture in the western slope. The exploitation of those sites can also release the tourism pressure in the north slope.

There are great potential tourists who would visit CBR. Nowadays, the international tourists are mainly coming from Korea (more than 90%). CBR will be attractive to tourists from Europe, America and Southeast Asia. With the development of ecotourism, the forms and contents of tourism will be greatly changed and the quality of tourism will be developed to a new stage.

Better administration is the effective way to the development of tourism resources. According to the managers, the tourism capacity of CBR is 6000 people a day, presently, the natural tourism resources have been damaged by human activities and this situation would be getting more and more serious with the development of tourism. Hence, strengthening tourism administration is an important aspect of sustainable development of tourism in CBR.

Renewing the tradition ideas of tourism development, developing ecotourism, and combining tourism with scientific education and nature conservation are very urgent in this area.

Recommendations

- In order to identify the priority of protection species, make the tourism exploitation strategy and allocate the limited fund reasonably, the comprehensive study of nature resources should be implemented in CBR.
- Since tourism is the main human activity, a periodical monitoring system for tourism impacts should be set up. The system should include monitoring items of tourism impacts on environment, economy and social culture. In addition, the tourism capacity should be future studied to make sure the effective development of ecotourism.

- Because Mt. Changbai is bordered with North Korea, it is necessary to cooperate with government of North Korea for the conservation of Mt. Changbai.

- Although the Korean tourists take 90% of all international tourists in CBR, the relevant tourism product market is not well established, and the relevant economic effects of tourism are not resulted. It is necessary to strengthen the construction of tourism facilities and attract tourists stay longer in CBR.

- Seasonal tourism items (in the fall and winter) should be those that do not damage the nature.

- Measures for bio-diversity conservation: 1)in-situ and ex-situ conservation, dynamic monitoring, 2)Exotic species controlling, such as *Taraxacum* and *Gramineae* grass, 3)Issue adequate regulations for species with ecological and economic importance, 4)Investigate the annual yield of wild green product, 5)Confirm the annual collectable amount of various products, 6)Register the collection activities of local people, 7)Dispatch green product collection licenses.

- Recommendations for tourism facilities: 1)Tourism facilities should be harmonize with the nature, 2)Ecosystem conservation should be considered, 3)Safety facilities should be considered, 4)Facilities that can reduce the environment impacts of tourism should be constructed.

- Several different tourism routes should be set up to lessen the pressure from tourists to some scenery sites.

- It is not advisable and suitable to wholly open the west slope until all tourism facilities have been set up.

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